Supplementary Information

Silica-coated bismuth sulfide nanorods as multimodal contrast agents

for non-invasive visualization of gastrointestinal tract

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Figure S1. TEM image of as-prepared Bi_2S_3 NRs.

Figure S2. (A) Wide-angle XRD pattern of the as-prepared Bi_2S_3 NRs. Bottom in (A): the standard pattern of pure hexagonal Bi_2S_3 (JCPDS No: 43-1471). (B) XPS spectrum of as-prepared Bi_2S_3 NRs. (C) Bi 4f XPS spectrum of as-prepared Bi_2S_3 NRs. (D) FT-IR spectra of Bi_2S_3 NRs before and after modification with TPGS.



Figure S3. Cumulative bismuth ion concentration released from $Bi_2S_3@SiO_2$ NRs.



Figure S4. Dynamic light scattering figure of Bi₂S₃@SiO₂ NRs.



Figure S5. UV-vis-NIR absorbance spectrum of Bi₂S₃@SiO₂ NRs.



Figure S6. Cell viability of 16HBE cells after cultured with various concentrations of

Bi₂S₃@SiO₂ NRs for 24 h.



Figure S7. The lifespan curves of worms treated with FUdR-containing plates with

different concentrations of Bi_2S_3 (2) SiO_2 NRs.



Figure S8. Effects of $Bi_2S_3@SiO_2$ NRs treatments on the accumulation of lipofuscin in age-synchronized worms. The intensity of fluorescence of the worms treated with different concentrations of $Bi_2S_3@SiO_2$ NRs relative to the control group.



Figure S9. Effects of $Bi_2S_3@SiO_2$ NRs on juglone-induced oxidative stress. The lifespan curves of 3-day old worms were pretreated with NGM plates with $Bi_2S_3@SiO_2$ NRs and then incubated with 600 μ M juglone at 20 °C.



Figure S10. Effects of $Bi_2S_3@SiO_2$ NRs treatments on thermotolerance. The viability of 3-day old worms treated with different concentrations of $Bi_2S_3@SiO_2$ NRs and exposed to 35 °C for 10 h. The above experiments was repeated at least 3 times, data are expressed mean \pm SEM.



Figure S11. BALB/c mice were used to test the *in vivo* toxicity of $Bi_2S_3@SiO_2$ NRs. The 300 µL of $Bi_2S_3@SiO_2$ NRs (10 mg/mL) which dispersed in physiological saline were orally delivered to mice (the number of mice in each group is 3) and the weights of mice are recorded at several time-points. The control group was received same volume of physiological saline in the same way.



Figure S12. *In vivo* CT coronal views of intestine in BALB/c nude mice at different intervals after oral administration of Bi₂S₃@SiO₂ NRs.



Figure S13. *In vivo* CT imaging of GI tract in BALB/c nude mice at different intervals after oral administration of barium sulfate dispersion.